# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering**
**Subject Code: 3163511**
**Semester – VI**
**Subject Name: Air Pollution Control – II**

**Type of course:** Professional Core Course

**Prerequisite:** Fundamentals of Air pollution and it's control

**Rationale:** The main objective of this subject is to make students aware about the control mechanism of air pollutants and control technologies for specific pollutants along with air quality modelling.

**Teaching and Examination Scheme:**

| Teaching Scheme | | | Credits | Examination Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory Marks | | Practical Marks | | |
| L | T | P | C | ESE (E) | PA (M) | ESE (V) | PA (I) | |
| 3 | 0 | 2 | 4 | 70 | 30 | 30 | 20 | 150 |

**Content:**

| Sr. No. | Content | Total Hrs |
|---|---|---|
| 1. | **Introduction to Air Pollution Control:** Various mechanisms to control gaseous pollutants and particulate matter.<br>**Control Equipment design:** Gravity chamber, Cyclone separator, Electrostatic precipitator, fabric filter, and absorption towers, wet scrubbers, adsorption towers. | 10 |
| 2. | **Control technologies for Specific pollutants:** Control of Sulphur dioxide emission (extraction from fuel, sulphur reduction during combustion, desulphurization, Processes using metal oxides and activated carbon, wet scrubbing),<br>control of nitrogen oxides (modification of operating condition, modification of design condition, treatment of effluent gas),<br>control of carbon mono oxide (CO), HC Control, Control of VOCs, $NH_3$, HCL, $Cl_2$, $H_2S$ | 10 |
| 3. | **Air Quality Modeling:** Introduction to Air Quality Modeling. Necessity, application and limitation of air quality modelling. Introduction to Dispersion Modeling, Photochemical Modeling and Receptor Modeling. Different air quality Dispersion models and their limitations.<br>Introduction to Gaussian Plume modelling, its assumption and limitation. GLC determination. Introduction to commonly used software-based models such as AERMOD, CALPUFF, ISCST3 and CALINE4 etc. | 12 |
| 4. | **Mobile Sources:** IC engine and cycle, A/F ratio, sources of air pollutants, control by process change, engine design change, Stratified charge engines, Rotary combustion engines, control by fuel change, catalytic converters | 4 |

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**Suggested Specification table with Marks (Theory):**

| Distribution of Theory Marks | | | | | |
|---|---|---|---|---|---|
| R Level | U Level | A Level | N Level | E Level | C Level |
| **15** | **15** | **15** | **10** | **08** | **07** |

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**


- Air Pollution Control – by Wark & Warner
- Air Pollution Control equipment calculations by Louis Theodore.
- Air Pollution – by M N Rao
- Air Pollution – by Henry Perkins
- Air Pollution and control – by Noel De nevers
- Catalytic Air Pollution Control Commercial Technology, Heck. R.M., Farrauto, R.J. and Gulati, S.T. Willey 3rd Ed.
- Air Pollution Control Equipment, Brauer, H and Varma, Y.B.G. Springer Verlag. 1981.
- Air Quality Modeling: Theories, Methodologies, Computational Techniques, and Available Databases and Software, Anfossi, D. EnviroComp, Volume 1, 2003.


**Course Outcomes:** After learning this course students will be able to

| Sr. No. | CO statement | Marks % weightage |
|---|---|---|
| CO-1 | Recollect various mechanisms to control gaseous pollutants and particulate matter. | 10 |
| CO-2 | Explain the working and designing of various air pollution control equipments. | 20 |
| CO-3 | Illustrate various specific pollutant control technologies. | 25 |
| CO-4 | Appraise various air quality models. | 15 |
| CO-5 | Explain the concept of software-based models for air quality modelling. | 15 |
| CO-6 | Summarise the control measures for mobile source of air pollution. | 15 |

**List of Practicals:**

- Sampling of PM 2.5 in ambient air.
- Sampling and analysis of nitrogen dioxide in ambient air.
- Demo of handy air sampler and sampling.
- Sampling and analysis of hydrochloric acid in ambient air.
- Air Quality Modelling using AERMOD Software